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CHEMICAL EXAMINATION OF THE ESSENTIAL OIL OF LANTANA CAMARA

SHAHID MAHMUD, A. SATTAR and S. A. KHAN

PCSIR Laboratories, Lahore.-16

Abstract. The essential oil of the flowers of *Lantana camara* on chemical examination was found to contain α-pinene (2.9%), β-pinene (1.7%), camphene (1.2%), limonene (1.4%), *p*-cymene (2.1%), caryophyllene (19.8%), salinene (13.8%), 1.8-cineol (10.4%), camphor (2.1%), geranyl acetate (4.9%), bis-(2-ethyl butyl) phthalate (16.0%) and an unidentified ester (12.1%). The yield of the oil was 0.15%.

Lantana camara belongs to the Verbenaceae family It is an evergreen shrub and is locally cultivated for hedge purposes. It has been reported[1] occurring wild in Europe, Australia, America and the Indo-Pakistan subcontinent. In Pakistan it fluorishes best in the Salt Range, the sub-Himalayan tract and the adjacent plains. Normally cattle do not graze on *L. camara* but if they feed on it because of hunger, it proves fatal for them. The toxicity of the plant it due to the presence of triterpenes,[2] Lantadene A and B. The other triterpenes occurring in *L. camara* are α-amyrin, β-sitosterol, lantalonic acid, lantic acid, 1-triacontanol, 3-ketourosolic acid, etc.

The flower of *L. camara* possesses sweet smell because of the presence of an essential oil but the leaves and stalks have little or no essential oil. The essential oil has been examined in different countries,[3] but no such investigations have so far been conducted on the species of the plant occurring it Pakistan. These studies are part of a survey of the essential oil-bearing plants of Pakistan for their commercial utilization in the aromatic world.

Experimental

The flowers of *L. camara* were collected from the species of the plant growing in and around the Laboratory premises and were allowed to dry in shade. The dry flowers (1.0 kg.) were left with 4 litres of hexane for overnight and then solvent was filtered. Hexane was removed under the vacuum of a water pump. A brown viscous liquid (3.52 g) was obtained as a residue which was steam distilled to remove the nonvolatile gummy matter. The distillate was extracted with hexane (3 × 50 ml). The organic layer was dried over anhydrous sodium sulphate and hexane was removed on a rotary evaporator to obtain a good smelling pale yellow oil (1.5 g, 0.15%). The physico-chemical properties of the essential oil were determined according to the standard methods[4] and are recorded below.

PHYSICO-CHEMICAL VALUES OF THE ESSENTIAL OIL OF *L. camara* FOUND WILD IN PAKISTAN

Yield of the oil	0.15%
Colour	Pale yellow
Specific gravity	0.901
Refractive index	1.4796
Optical rotation	+9°.15'
Acid value	0
Ester value	42
Terpene hydrocarbons	42.7%
Oxygenated terpenes	45.5%

Chromatography :

2 g of the essential oil were absorbed on a column packed with silica gel (80 g). The column was eluted with hexane (4 × 20 ml) to obtain a hydrocarbon fraction. This was further resolved into individual components by GLC using a column packed with 7.5% carbowax on celite (60-80 mesh). Nitrogen was used as the carrier gas. The column was run at 110° and 170° for the resolution of monoterpenes and sesquiterpenes respectively.

The oxygenated components were eluted from the column with steadily increasing proportion of diethyl ether (20.0%) in hexane. The column was finally washed with 100% ether. Homogeneity of different fractions was checked by TLC and GLC and fractions with identical behaviour were mixed together. Thus seven single component fractions were obtained. These were identified by comparision of their ir with standard spectra,[5] m.p., TLC, GLC and conversion to known derivatives. The percentages of different components of the essential oil were determined from the GLC traces.

Results and Discussion

Direct steam distillation of the flowers of *L. camara* did not give good yield of the essential oil which was 0.11% compared to 0.15% obtained first by hexane extraction and then steam distilling the brown liquid. The residue in the latter method was a soft, wax like substance which was not explored further.

The hexane eluted fraction from the silica column consisted mainly of hydrocarbons. The composition of this fraction was examined by GLC. In all fourteen peaks were detected on GLC, out of which only seven could be identified. These were in order ; α-pinene (2.9%), β-pinene (1.7%), *p*-cymene (2.1%), caryophyllene (19.8%) and salinene (13.8%). The rest were minor in amount and could not be detected.

Column chromatography with 2% ether in hexane gave a fraction (10.4%) which had ir : *v* max 2890, 1455, 1370, 1350, 1075, 1045, 980, 840 cm^{-1} . IR comparison and the chemical behaviour[6] of this fraction proved it to be 1, 8-cineol.

5% ether in hexane gave a fraction (2.1%), the ir : *v* max 2950, 1725, 1450, 1435, 1380, 1320, 1280, 1045, 1020, 850, 755 cm^{-1} of which was identical with camphor.

Third oxygenated fraction (5.1%) came with 10% ethyl ether in hexane ; its ir : *v* max, 2920, 2850, 1760, 1450, 1375, 1365, 1230, 1025, 955 cm^{-1} and the chemical properties were identical with geranyl acetate.

Columning the essential oil with 15% ether in hexane gave a viscous fraction (16.0%) whose ir : *v* max 2900, 2850, 1720, 1600, and 1575 (doublet), 1455, 1375, 1270, 1120, 1070, 740, 700 cm^{-1} showed it to be a phthalate ester. The structure could not be confirmed because of the lack of facilities but its ir resembled more closely with a standard ir spectrum of bis (2-ethyl butyl) phthalate than the other phthalate esters.

20% ether in hexane gave another ester (12.1%) of undetermined structure. The column was finally washed with ether to give a brown material (4.1%), which was not investigated further.

It is concluded from the above physico-chemical evaluation of the essential oil of *L. camara* that the yield of the oil was low (0.15%) : beside it contained high percentage of terpene hydrocarbons (42.7%), which makes it little or of no commercial value.

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References

1. (a) R. N. Parker, A Forest Flora for the Punjab with Hazara and Delhi (Government Printing, West Pakistan, 1956), p. 392.
   (b) K. R. Kirtikar and B. D. Basu, Indian Medicinal Plants (Lalilat Mohan Basu, India, (1935), Vol. III, P. 1914.
2. (a) Ramesh Hari, G. A. Shivnami and H. C. JOSHI, Indian J. Anim, Sci., **43**, 829 (1973) ; CA. **82**, 165614 (1975).
   (b) R. P. Uppal and B. S. Paul, Haryana Agri Univ. J. Res., **1**(2), 98 (1971) ; CA. **77**, 1545.
   (c) N. K. Hart, J. A. Lamberton, A. A. Sioumis and H. Suaris, Aust. J. Chem., **29** 655 (1976).
3. (a) L. Peyson, M. Broua and M. Rouband, Parfums, Cosmet Savons Fr. **2** (**5**), 205 (1972) ; CA **77**, 52207 g (1972).
   (b) Z. F. Ahmad, A. M. EL-Moghazy Shoaib, G. M. Wassei and S. M. El-Sayyad, Planta Med. **21**(**3**), 282 (1972). CA. **77**, 58863 q (1972). CA **77**, 58863 q (1972).
   (c) M. Saleh, Planta Med. **25**, 373 (1974) ; CA **81** 101810 (1974).
4. E. Guenther, *The Essential Oils*, (D. Van Nostrand Company Inc. New York, 1948) Vol. I, p-229.
5. *Sadtler Standard Spectra*, The Sadtler Research Laboratories, Pennsylvania, USA, (1961).
6. E. Guenther, *The Essential Oils* (D. Von Nostrand Company, Inc. New York, 1949), Vol. II, p.708.